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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,597	02/18/2004	Horii Hideki	5649-1227	2665

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Timothy J. O'Sullivan, Esq.
Myers, Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627

EXAMINER

SOWARD, IDA M

ART UNIT PAPER NUMBER

2822

DATE MAILED: 08/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/781,597

Applicant(s)

HIDEKI ET AL.

Examiner

Ida M. Soward

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 18 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) 28-50 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-27 is/are allowed.
- 6) ☒ Claim(s) 1,2 and 5-9 is/are rejected.
- 7) ☒ Claim(s) 3,4,10 and 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the application filed February 18, 2004.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-27, drawn to a phase-changeable memory device, classified in class 257, subclass 4.
- II. Claims 28-50, drawn to method of forming a phase-changeable memory device, classified in class 438, subclass 900.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). Unpatentability of the Group I invention would not necessarily imply unpatentability of the Group II invention, since the device of the Group I invention could be made by a process materially different from those/that of the Group II invention. In the instant case, the process as claimed can be used to make other and materially different memory device.

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Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Bob Crouse on August 3, 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-27. Affirmation of this election must be made by applicant in replying to this Office action. Claims 28-50 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

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only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2 and 5-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu (US 6,437,383 B1).

In regard to claim 1, Xu teaches a phase-changeable memory device, comprising: a phase-changeable material pattern 290 of a phase-changeable material that includes nitrogen atoms; and first and second electrodes 230 electrically connected to the phase-changeable material pattern 290 and provide an electrical signal thereto (Figure 18, columns 8 and 10, lines 55-63 and 17-64, respectively).

In regard to claim 2, Xu teaches the phase-changeable material pattern 290 having a polycrystalline structure (columns 10 and 12, lines 17-28 and 6-10, respectively).

In regard to claim 5, Xu teaches the first and second electrodes 230 comprising a conductive material containing nitrogen, a conductive material containing carbon, titanium, tungsten, molybdenum, tantalum, titanium silicide, tantalum silicide and/or a combination thereof (column 9, lines 3-15).

In regard to claim 6, Xu teaches the first and/or second conductive electrodes further include one of a metal nitride, a refractory metal nitride, a metal silicon nitride, a refractory metal silicon nitride, a metal silicide, and a refractory metal silicide (column 9, lines 3-15).

In regard to claim 7, Xu teaches the conductive material containing nitrogen comprising a metal nitride (column 9, lines 3-15).

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In regard to claims 8, Xu teaches a transistor including a source region 200, a drain region 200 and a gate electrode 160; a lower interconnection 132 electrically connected to the drain region 200; and an upper metal interconnection electrically connected to one of the first and second electrodes; wherein the other of the first and second electrodes 230 is electrically connected to the source region 200 (Figure 18, column 7, lines 1-67).

In regard to claim 9, Xu teaches a phase-changeable memory device, comprising: a phase-changeable material pattern 290 of a phase-changeable material having a polycrystalline structure; and first and second electrodes 230 electrically connected to the phase-changeable material pattern 290 to provide an electrical signal thereto (Figure 18, columns 8 and 10, lines 55-63 and 17-64, respectively).

Allowable Subject Matter

Claims 12-27 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not disclose, make obvious, or otherwise suggest the structure of the applicant's together with the other limitations of the independent claims, such as but not limited to a contact pad disposed in the interlayer dielectric layer at substantially the same height and formed of the same material as the lower interconnection; a lower intermetal dielectric layer disposed on the interlayer dielectric layer; a variable resistor electrically connected to the contact pad; an upper intermetal

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dielectric layer disposed on the lower intermetal dielectric layer to cover a side of the variable resistor; and an upper interconnection disposed in the upper intermetal dielectric layer to connect to the variable resistor electrically, wherein the variable resistor comprises: a bottom electrode penetrating a portion of the lower intermetal dielectric layer to electrically connect to the contact pad; a phase-changeable material pattern containing nitrogen atoms disposed on the lower intermetal dielectric layer and on the bottom electrode ; and a top electrode disposed on the phase-changeable material pattern to electrically connect to the upper interconnection. The dependent claims being further limiting and definite are also allowable.

Claims 3-4, 10-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to phase-changeable memory devices:

Chen (US 6,759,267 B2)

Hudgens et al. (US 66,774,388 B2)

Lowrey et al. (US 2004/0115945 A1)

Lowrey et al. (US 6,919,578 B2).

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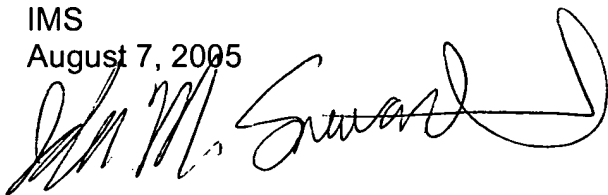
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M. Soward whose telephone number is 571-272-1845. The examiner can normally be reached on Monday - Thursday 6:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

IMS

August 7, 2005

A handwritten signature in black ink, appearing to read 'Ida M. Soward', with a large, stylized loop at the end.

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